CLAIMS

What is Claimed is:

1. A method of making an optical diffracting device, said method comprising:

growing a first semiconductor layer on a semiconductor substrate, said first semiconductor layer being made of semiconductor material having an index of refraction;

depositing a dielectric layer on the first semiconductor layer;

patterning and etching the dielectric layer to form openings in the dielectric layer to expose selective areas on the first semiconductor layer and to create diffraction regions made out of the dielectric material; and

growing a second semiconductor layer by an epitaxial growth process on the first semiconductor layer between the dielectric diffraction regions.

2. The method according to claim 1 wherein growing a second semiconductor layer includes growing the second layer so that it encloses the dielectric diffraction regions.

3. The method according to claim 1 wherein growing the second semiconductor layer includes growing the second semiconductor layer to be made of the same material as the first semiconductor layer so that the dielectric diffraction regions are embedded regions in a common semiconductor region.

4. The method according to claim 1 wherein growing the second semiconductor

layer includes growing the second semiconductor layer to be made of a different material than the first semiconductor layer having a different index of refraction.

5. The method according to claim 1 further comprising growing a third semiconductor layer over the second semiconductor layer and the dielectric diffraction regions.

6. The method according to claim 5 wherein growing the third semiconductor layer includes growing the third semiconductor layer to be made of a semiconductor material that is different than the material of the first semiconductor layer, wherein the material of the third semiconductor layer has a higher index of refraction than the index of refraction of the first semiconductor layer.

7. The method according to claim 1 further comprising etching access vias through the second semiconductor layer to expose the dielectric diffraction regions and etching away the diffraction region material to define the diffraction regions out of air.

8. A method of making an optical diffracting device, said method comprising:

growing a first semiconductor layer on a semiconductor substrate;

depositing a dielectric layer on the first semiconductor layer opposite to the substrate;

patterning and etching the dielectric layer to form openings in the dielectric layer to expose selective areas on the first semiconductor layer and to create diffraction regions made out of the dielectric material, where the dielectric diffraction regions are spaced apart dielectric strips;

growing a second semiconductor layer by an epitaxial growth process on the first semiconductor layer between the dielectric diffraction regions so that the second semiconductor layer completely encloses the dielectric diffraction regions;

etching access vias through the second semiconductor layer to expose the dielectric diffraction regions; and

etching away the diffraction region material to define the diffraction regions out of air.

9. The method according to claim 8 wherein growing the second semiconductor layer includes growing the second semiconductor layer to be made of the same material as the first semiconductor layer so that the dielectric diffraction regions are embedded regions.

10. The method according to claim 8 wherein growing the second semiconductor layer includes growing the second semiconductor layer to be made of a different material than the first semiconductor layer having a different index of refraction.

11. The method according to claim 8 further comprising growing a third

semiconductor layer over the second semiconductor layer and the dielectric diffraction regions.

12. The method according to claim 11 wherein growing the third semiconductor layer includes growing the third semiconductor layer to be made of a semiconductor material that is different than the material of the first semiconductor layer, wherein the material of the third semiconductor layer has a higher index of refraction than the index of refraction of the first semiconductor layer.

13. A method of making an optical diffracting device, said method comprising:

growing a first semiconductor layer on a semiconductor substrate;

depositing a dielectric layer on the first semiconductor layer opposite to the substrate;

patterning and etching the dielectric layer to form openings in the dielectric layer to expose selective areas on the first semiconductor layer and to create diffraction regions made out of the dielectric material, wherein the dielectric diffraction regions are spaced apart dielectric strips;

growing a second semiconductor layer by an epitaxial growth process on the first semiconductor layer between the dielectric diffraction regions so that the second semiconductor layer completely encloses the dielectric diffraction regions;

etching access vias through the second semiconductor layer to expose the

dielectric diffraction regions;

etching away the diffraction region material to define the diffraction regions out of air; and

growing a third semiconductor layer over the second semiconductor layer and the dielectric diffraction regions wherein growing the third semiconductor layer includes growing the third semiconductor layer to be made of a semiconductor material that is different than the material of the first semiconductor layer, wherein the material of the third semiconductor layer has a higher index of refraction than the index of refraction of the first semiconductor layer.

14. The method according to claim 13 wherein growing the second semiconductor layer includes growing the second semiconductor layer to be made of the same material as the first semiconductor layer so that the dielectric diffraction regions are embedded regions in a common semiconductor region.

15. The method according to claim 13 wherein growing the second semiconductor layer includes growing the second semiconductor layer to be made of a different material than the first semiconductor layer having a different index of refraction.